



SEQUENCE LISTING

<110> Mayo, Stephen L.
Dahiyat, Bassil L.
Gordon, D. Benjamin
Street, Arthur
Su, Yaoying

<120> Apparatus and Method for Automated Protein Design

<130> A-65353-6/RFT/RMS/RMK

<140> 09/812,034

<141> 2001-03-19

<150> 09/127,926

<151> 1998-07-31

<150> 60/043,464

<151> 1997-04-11

<150> 60/054,678

<151> 1997-08-04

<150> 60/061,097

<151> 1997-10-03

<150> 09/058,459

<151> 1998-04-10

<150> 60/087,561

<151> 1998-06-01

<160> 99

<170> PatentIn Ver. 2.1

<210> 1

<211> 28

<212> PRT

<213> Mouse

<400> 1

Lys Pro Phe Gln Cys Arg Ile Cys Met Arg Asn Phe Ser Arg Ser Asp
1 5 10 15

His Leu Thr Thr His Ile Arg Thr His Thr Gly Glu
20 25

<210> 2

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 2

Lys Pro Tyr Thr Ala Arg Ile Lys Gly Arg Thr Phe Ser Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Leu Glu Thr Phe Thr Gly Arg
20 25

<210> 3
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 3
Gln Gln Tyr Thr Ala Lys Ile Lys Gly Arg Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 4
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 4
Glu Gln Tyr Thr Ala Lys Ile Lys Gly His Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Arg Phe Lys Gly Arg
20 25

<210> 5
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 5
Gln Gln Tyr Thr Ala Lys Ile Arg Gly Thr Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 6
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 6

Gln Gln Tyr Thr Ala Lys Phe Lys Gly Arg Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Glu Gly Arg
20 25

<210> 7

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 7

Gln Gln Tyr Thr Ala Lys Ile Lys Gly Arg Ile Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Arg Phe Glu Gly Arg
20 25

<210> 8

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 8

Glu Gln Tyr Thr Ala Lys Ile Lys Gly Lys Thr Phe Arg Asn Lys Arg
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 9

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 9

Glu Gln Tyr Thr Ala Lys Tyr Lys Gly Arg Thr Phe Arg Asn Lys Arg
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 10

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 10

Glu Gln Tyr Thr Ala Lys Ile Lys Gly Gln Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 11

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 11

Gln Arg Tyr Thr Ala Lys Ile Lys Gly Arg Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Arg Phe Lys Gly Arg
20 25

<210> 12

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 12

Gln Glu Tyr Thr Ala Lys Ile Lys Gly Arg Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Arg Phe Lys Gly Arg
20 25

<210> 13

<211> 27

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 13

Gln Tyr Thr Ala Lys Ile Lys Gly Arg Thr Phe Arg Asn Lys Arg Glu
1 5 10 15

Leu Arg Asp Phe Ile Glu His Phe Lys Gly Arg
20 25

<210> 14

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 14

Thr Gln Tyr Thr Ala Lys Ile Lys Gly Arg Thr Phe Arg Asn Lys Glu
1 5 10 15

Glu Leu Lys Lys Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 15

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 15

Gln Glu Tyr Thr Ala Lys Ile Lys Gly Arg Thr Phe Arg Asn Lys Arg
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 16

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 16

Glu Gln Tyr Thr Ala Lys Ile Lys Gly Arg Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Ile Arg Asp Phe Ile Glu Lys Phe Thr Gly Arg
20 25

<210> 17

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 17

Glu Gln Tyr Thr Ala Lys Ile Lys Gly Lys Thr Phe Arg Asn Glu Arg
1 5 10 15

Glu Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 18
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 18
Gln Gln Tyr Thr Ala Lys Ile Lys Gly Lys Thr Phe Arg Asn Lys Asp
1 5 10 15

Glu Leu Lys Lys Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 19
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 19
Gln Gln Tyr Thr Ala Lys Ile Lys Gly Lys Thr Phe Arg Asn Lys Arg
1 5 10 15

Glu Leu Gln Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 20
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 20
Glu Gln Tyr Thr Ala Lys Val Lys Gly Glu Thr Phe Glu Asn Glu Lys
1 5 10 15

Arg Leu Arg Asp Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 21
<211> 28
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 21
Glu Gln Tyr Thr Ala Lys Ile Lys Gly Lys Thr Phe Arg Asn Glu Lys
1 5 10 15

Glu Leu Lys Arg Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 22

<211> 28

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

<400> 22

Glu Gln Tyr Thr Ala Lys Phe Lys Gly Lys Thr Phe Arg Asn Lys Glu
1 5 10 15

Glu Leu Lys Lys Phe Ile Glu Lys Phe Lys Gly Arg
20 25

<210> 23

<211> 33

<212> PRT

<213> yeast

<400> 23

Arg Met Lys Gln Leu Glu Asp Lys Val Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Leu Glu Asn Glu Val Ala Arg Leu Lys Lys Leu Val Gly Glu
20 25 30

Arg

<210> 24

<211> 33

<212> PRT

<213> yeast

<400> 24

Arg Met Lys Gln Leu Glu Asp Lys Val Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Leu Glu Asn Glu Val Ala Arg Leu Lys Lys Leu Ala Gly Glu
20 25 30

Arg

<210> 25

<211> 33

<212> PRT

<213> yeast

<400> 25

Arg Met Lys Gln Leu Glu Asp Lys Val Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Leu Glu Asn Glu Met Ala Arg Leu Lys Lys Leu Val Gly Glu
20 25 30

Arg

<210> 26
<211> 33
<212> PRT
<213> yeast

<400> 26
Arg Leu Lys Gln Met Glu Asp Lys Val Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Leu Glu Asn Glu Val Ala Arg Leu Lys Lys Leu Val Gly Glu
20 25 30

Arg

<210> 27
<211> 33
<212> PRT
<213> yeast

<400> 27
Arg Leu Lys Gln Met Glu Asp Lys Val Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Leu Glu Asn Glu Val Ala Arg Leu Lys Lys Leu Ala Gly Glu
20 25 30

Arg

<210> 28
<211> 33
<212> PRT
<213> yeast

<400> 28
Arg Met Lys Gln Trp Glu Asp Lys Ala Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Leu Glu Asn Glu Val Ala Arg Leu Lys Lys Leu Val Gly Glu
20 25 30

Arg

<210> 29
<211> 33
<212> PRT
<213> yeast

<400> 29

Arg Met Lys Gln Phe Glu Asp Lys Val Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Leu Glu Asn Glu Val Ala Arg Leu Lys Lys Leu Val Gly Glu
20 25 30

Arg

<210> 30
<211> 33
<212> PRT
<213> yeast

<400> 30
Arg Met Lys Gln Leu Glu Asp Lys Val Glu Glu Leu Leu Ser Lys Asn
1 5 10 15

Tyr His Ala Glu Asn Glu Val Ala Arg Leu Lys Lys Leu Val Gly Glu
20 25 30

Arg

<210> 31
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 31
Lys Gln Asp Glu Glu Ser Tyr His Asn Ala Arg Lys
1 5 10

<210> 32
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 32
Glu Lys Asp Arg Glu Arg Arg Arg Glu Arg Arg Glu
1 5 10

<210> 33
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 33

Glu Lys Gln Lys Glu Arg Glu Arg Glu Glu Arg Gln
1 5 10

<210> 34
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 34
Ala Arg Ala Ala Ala Ala Arg Arg Arg Ala Arg Ala
1 5 10

<210> 35
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 35
Arg Glu Glu Arg Arg Arg Glu Asp Arg Lys Arg Glu
1 5 10

<210> 36
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 36
Asn Thr Arg Ala Lys Ser Ala Asn His Asn Thr Gln
1 5 10

<210> 37
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic

<400> 37
Ala Ala Ala Ala Ala Ala Ala Ala Ala Ala Ala
1 5 10

<210> 38
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 38

Met Thr Tyr Lys Leu Ile Leu Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Val Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 39

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 39

Met Thr Trp Lys Tyr Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ile Val Asp Ala Ala Thr Phe Glu Lys Val Trp Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Phe Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Leu Thr Ile Thr Glu
50 55

<210> 40

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 40

Met Thr Phe Lys Ile Ile Phe Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ile Val Asp Ala Ala Thr Val Glu Lys Val Trp Lys Gln
20 25 30

Tyr Val Asn Asp Asn Gly Leu Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Ile Thr Glu
50 55

<210> 41

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 41

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ile Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Ile Thr Glu
50 55

<210> 42

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 42

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 43

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 43

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 44

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 44

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala

35

40

45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 45

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 45

Met Thr Phe Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 46

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 46

Met Thr Phe Lys Leu Ile Ala Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Val Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 47

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 47

Met Thr Ala Lys Ala Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Ile Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Val Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Ile Thr Ile Thr Glu
50 55

<210> 48
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 48
Met Thr Ala Lys Leu Ile Ala Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Ala Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Val Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Ile Thr Ile Thr Glu
50 55

<210> 49
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 49
Met Thr Ala Lys Ala Ile Ala Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Ala Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Val Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Leu Thr Val Thr Glu
50 55

<210> 50
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 50
Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 51
<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 51

Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 52

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 52

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Phe Thr Phe Thr Glu
50 55

<210> 53

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 53

Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Phe Thr Phe Thr Glu
50 55

<210> 54

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 54

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Val Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 55

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 55

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Val Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 56

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 56

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Tyr Thr Phe Thr Glu
50 55

<210> 57

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 57

Met Thr Phe Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln

20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 58
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 58
Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 59
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 59
Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Val Thr Glu
50 55

<210> 60
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 60
Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Val Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 61
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 61
Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Val Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 62
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 62
Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Tyr Lys Gln
20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 63
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 63
Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Tyr Thr Phe Thr Glu
50 55

<210> 64
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 64
 Met Thr Tyr Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Tyr Thr Phe Thr Glu
 50 55

<210> 65
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 65
 Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Phe Thr Ile Thr Glu
 50 55

<210> 66
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 66
 Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ile Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 67
 <211> 56
 <212> PRT

<213> Streptococcus sp.

<400> 67

Met Thr Phe Lys Ile Ile Phe Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 68

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 68

Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Phe Thr Ile Thr Glu
50 55

<210> 69

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 69

Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ile Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 70

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 70

Met Thr Tyr Lys Ile Ile Phe Asn Gly Lys Thr Leu Lys Gly Glu Thr

1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 71
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 71

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
 50 55

<210> 72
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 72

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Ile Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Phe Thr Phe Thr Glu
 50 55

<210> 73
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 73

Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Ala Asn Asp Asn Gly Val Asp Gly Glu Ile Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 74
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 74
 Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 75
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 75
 Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
 50 55

<210> 76
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 76
 Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Trp Thr Ile Thr Glu
50 55

<210> 77

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 77

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Val Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Phe Thr Glu
50 55

<210> 78

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 78

Met Thr Tyr Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Leu Asn Asp Asn Gly Ile Asp Gly Glu Ile Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Phe Thr Glu
50 55

<210> 79

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 79

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Tyr Thr Ile Thr Glu
50 55

<210> 80
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 80
 Met Thr Phe Lys Ile Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Val Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 81
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 81
 Met Thr Phe Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 82
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 82
 Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 83
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 83

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Trp Thr Val Thr Glu
50 55

<210> 84

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 84

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ile Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Trp Thr Val Thr Glu
50 55

<210> 85

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 85

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Leu Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ile Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Trp Thr Val Thr Glu
50 55

<210> 86

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 86

Met Thr Ala Lys Ala Ile Ala Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Ala Lys Gln
 20 25 30

Tyr Ala Asn Asp Asn Gly Leu Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Ala Thr Ala Thr Glu
 50 55

<210> 87

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 87

Met Thr Phe Lys Ala Ile Ala Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Ala Lys Gln
 20 25 30

Tyr Ala Asn Asp Asn Gly Leu Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Ala Thr Ala Thr Glu
 50 55

<210> 88

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 88

Met Thr Phe Lys Ala Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 89

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 89

Met Thr Phe Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 90

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 90

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Phe Thr Val Thr Glu
50 55

<210> 91

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 91

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Val Thr Glu
50 55

<210> 92

<211> 56

<212> PRT

<213> Streptococcus sp.

<400> 92

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Val Thr Glu

50

55

<210> 93
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 93

Met Thr Val Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Val Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 94
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 94

Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Val Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Phe Thr Val Thr Glu
 50 55

<210> 95
 <211> 56
 <212> PRT
 <213> Streptococcus sp.

<400> 95

Met Thr Phe Lys Leu Ile Ala Asn Gly Lys Thr Leu Lys Gly Glu Thr
 1 5 10 15
 Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
 20 25 30
 Tyr Ala Asn Asp Asn Gly Leu Asp Gly Glu Trp Thr Tyr Asp Asp Ala
 35 40 45
 Thr Lys Thr Trp Thr Val Thr Glu
 50 55

<210> 96

<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 96
Met Thr Phe Lys Leu Ile Leu Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Leu Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Trp Thr Ala Thr Glu
50 55

<210> 97
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 97
Met Thr Phe Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Phe Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Trp Thr Val Thr Glu
50 55

<210> 98
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 98
Met Thr Phe Lys Leu Ile Ile Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15
Thr Thr Glu Val Val Asp Ala Ala Thr Ala Glu Lys Val Trp Lys Gln
20 25 30
Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45
Thr Lys Thr Leu Thr Val Thr Glu
50 55

<210> 99
<211> 56
<212> PRT
<213> Streptococcus sp.

<400> 99

Met Thr Phe Lys Leu Ile Val Asn Gly Lys Thr Leu Lys Gly Glu Thr
1 5 10 15

Thr Thr Glu Ala Val Asp Ala Ala Thr Ala Glu Lys Val Tyr Lys Gln
20 25 30

Tyr Ala Asn Asp Asn Gly Ile Asp Gly Glu Trp Thr Tyr Asp Asp Ala
35 40 45

Thr Lys Thr Trp Thr Val Thr Glu
50 55